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Effects of nutrition style on metabolism

Eurasian Clinical and Analytical Medicine Review

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Abstract

Introduction: Meal frequency regulation and caloric restriction are gaining importance in modern dietary recommendations. The effects of caloric restriction on metabolism are approximately known. However, the combined effects of meal frequency and caloric restriction have not been adequately investigated. New research is needed to determine the ideal nutritional model that can be effective in preventing diabetes, cardiovascular disease, obesity, and many cancers. The current study emphasizes that there are not enough studies in the literature on the effects of meal frequency and calorie restriction on metabolism.

Keywords

nutrition, meal frequency, caloric restriction, metabolism, insulin resistance

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Introduction

Nutrition is defined as organisms taking nutritional elements from outside and using them effectively in order to facilitate all functions of living, especially growth and development.[1] The effects of nutrition on metabolism have been examined by various researchers for years.

The increasing incidence of obesity and prominence of the relationship between nutrition and various chronic diseases necessitate detailed investigation of the relationship between nutrition and metabolism. This study aims to draw attention to the effects of meal frequency and caloric restriction on metabolism. In our literature review, we did not encounter any studies that examined the effects on the antioxidant system of types of feeding in conjunction with caloric restriction. Additionally, most of the experimental and clinical studies focus on the effects on the antioxidant system of the meal contents, rather than the meal frequency or the amount of calories.[2-6] Studies investigating the effects of meal frequency on metabolism are rather outdated ones that examine the effects on metabolic enzymes and hormones without investigating the antioxidant system.[7-11] The general relationship between meal frequency and metabolism has by now been established, but the results of the current study will help to reveal the effect of meal frequency on the antioxidant system. It is known that excessive energy intake in humans increases the risk of diabetes, cancer, and cardiovascular diseases. On the other hand, the effects of increased meal frequency on human health or lifespan are not clear.[12] Increased meal frequency in humans has been linked to hepatic steatosis, increase in triglycerides, and obesity.[13] Caloric restriction in animals is the intake of calories reduced by 20-40% as opposed to feeding ad libitum.[14] Caloric restriction in humans is recommended in similar ratios. When caloric intake is reduced by 20-40%, vitamin and mineral supplementation should increase as intake decreases in order to prevent malnutrition.[15] Caloric restriction, due to its effects on the blood lipid profile, reduces blood pressure and heart beats per minute.[16,17]

Caloric restriction also prevents development of insulin resistance by reducing fasting insulin and glucose levels.[18] From an evolutionary perspective, in the periods where sources of nutrition were not continuously available, bodies needed to store excess amounts of energy in order to sustain life. Fat cells located in fat tissue reservoirs in the human body have adapted to store excess energy as triglycerides and to release these as free fatty acids to be used as energy in other parts of the body when needed. The fat storage and usage system governed by neural and endocrinal systems helps humans to survive periods of prolonged hunger. However, the combination of excessive feeding and sedentary life style, along with genetic factors, increases fat reservoirs excessively and creates negative health conditions. Obesity, the condition where fat tissue mass is in excess, is the primary cause of other diseases.[19]

Caloric restriction may be defined as the reduction of caloric intake while sustaining essential nutritional needs, and it is different from constant hunger. In other words, caloric restriction is the reduction of total intake of food without causing malnutrition or sacrificing specific essential nutrients.[20,21] Another study has shown that caloric restriction has anti-aging and lifespan-increasing effects and has also provided information on possible neuroprotective effects.[22] Oxidative stress, mitochondrial damage, inflammation, and changes in the structure of proteins' DNA are important factors inducing neurodegeneration. It is thought that reduction of oxidative stress and stimulation of neutrophil production lie behind the mechanism related to reduction of neurodegenerative changes by caloric restriction.[23-26] Another study also found that caloric restriction increased insulin sensitivity and protection against insulin resistance; decreased triglyceride, total cholesterol, and LDL cholesterol levels; increased HDL cholester levels; and decreased the incidence of cerebrovascular diseases.[27] All these studies show that how much you eat and how often you eat is as important as what you eat. In other words, nutrition style is important for regulation of metabolism. These studies have yielded promising findings about the effect of meal frequency on the antioxidant system. The study results have shown that, like caloric restriction, reducing meal frequency probably strengthens the antioxidant system and reduces oxidative stress. Therefore, eating less and eating less frequently represent an alternative protective treatment in the prevention of the hundreds of diseases known to be related to oxidative stress.[28-30] In our previous studies, we have found beneficial effects of reduced meal frequency and caloric restriction on insulin resistance, weight gain, the antioxidant system, diabetes, obesity, and metabolism.[31-33]

Conclusion

The amount and frequency of food intake are as important as the content. Future studies of longer duration; life-long observational studies regarding the effects on lifespan; incorporating the factor of sex; and establishing study groups combining nutrition and exercise interventions may lead to new findings that are likely to confirm past results. Reduced meal frequency and caloric restriction have positive effects on metabolic efficiency and function-specifically, on key enzymes and basic regulatory hormones in carbohydrate, lipid, and protein synthesis and degradation pathways. Thus, it may be possible to avert insulin resistance, diabetes, obesity, and many other related diseases by eating less frequently and in smaller amounts.

Declarations

Animal and Human Rights Statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

Data Availability

The datasets used and/or analyzed during the current study are not publicly available due to patient privacy reasons but are available from the corresponding author on reasonable request.

Conflict of Interest

None of the authors received any type of financial support that could be considered potential conflict of interest regarding the manuscript or its submission.

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Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

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